

# Data Security using QR Code and Steganography

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**Abstract-** Securing data plays a major role in this internet era. Transferring confidential message is a real challenge and is the need of the hour. A cryptography and Steganography technique helps in secure data transmission. Steganography is the method of hiding secret message in the image whereas cryptography is about altering the message into a different form, so that it is prevented from unauthorized access. QR (Quick Response) Codes are 2D bar codes that encode data. They can store information in both vertical and horizontal direction. Combining both the steganography and cryptography techniques will yield a secure and sophisticated system for exchanging the secret message between the sender and receiver. XOR function is used for encryption and decryption process. QR code hiding is done using the least significant bit method. The encryption, QR code hiding, extraction and decryption of secret message is implemented using the MATLAB software.

**Keywords-** steganography; QR code; encryption; xor cipher; decryption;

## I. INTRODUCTION

Security and securing important data is very important to make sure that data cannot be misused by any unauthorized person. The attackers are always ready to steal personal data or important data of a person or an organization, and misuse them in various ways. For this reason, cryptography is very important. Due to advancements in communicating methods it is a necessity to raise a method for transferring secret message securely over a communication channel. Steganography involves hiding messages in images which are referred as cover images. Digital data can be easily copied, modified and retransmitted in the network by any user. To support the growth of multimedia communication, it is essential to develop tools that protect an digital information. By combining both Cryptography and Steganography, a secure method can be built. Steganography involves hiding messages in images which are called as cover images. The embedded messages cannot be recovered without knowing the exact steganographic cover methodology.

## II. METHODOLOGY

### A. Cryptography

Cryptography is the study related to data security such as confidentiality and data authentication. Cipher is the

encrypted data. Plaintext is the original message being encrypted and the data of the encryption output is called cipher text.



Fig. 1: Plaintext and Cipher text

In this proposed method we used xor method for encryption the entered secrete message is xored with the secret key the obtained cipher text is converted to QR code. XOR is a two-way function.

### B QR Code

QR (Quick Response) Codes are 2D bar codes that encode secret message. QR code stores data in both vertical form and horizontal form which can be extracted.



Fig. 2: QR Code

The QR code consists of three squares at the corners which are called finder patterns these are located at the top left, top right and bottom left. The small dots in the QR code represents binary numbers. Code words are 8 bits long and Reed-Solomon error correction algorithm is used for error correction. The following list shows the error correction capability at the four levels:

Level L (Low): 7% of code words can be corrected.

Level M (Medium): 15% of code words can be corrected.

Level Q (Quarterly): 25% of code words can be corrected.

Level H (High): 30% of code words can be corrected.



Fig. 3: Format information

QR has the ability to sustain damage and continue to function even when a part of the QR code is removed.

C. Steganography

Steganography is the technique used to embed the secret message within the cover image. Steganography is a secure way for transmission of information over the communications channel. This technique makes it possible to send information without the fear of the messages being intercepted. People will not accept the changes in images, audio or video files because of a watermark, so by using steganographic methods we can avoid the noticeable changes in image and video files. The LSB is one of the most popular methods used to embed the secret message within the image

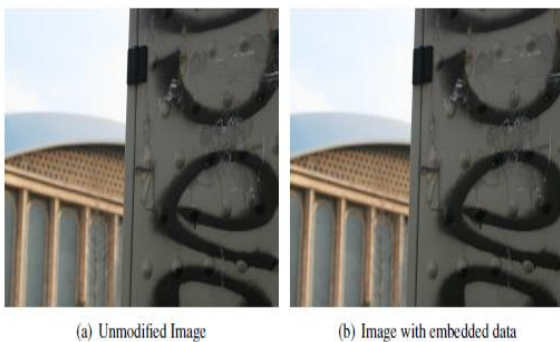


Fig. 4: Visual effect of least significant bit embedding

D. Encryption Process

The secret message is XORed with the key to form cipher text. The cipher text is then converted into QR code. Steganography method is used to embed the QR code inside the image. The whole process is implemented using MATLAB software. XOR function is used for encryption process. QR code hiding is done using the least significant bit method.

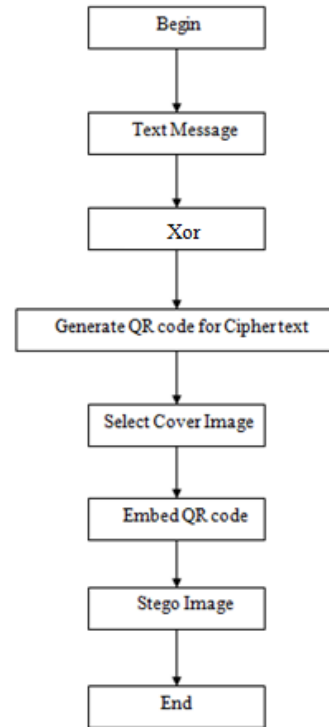


Fig. 5: Flow chart for Encryption Process

The steps involved in this encryption process are:

- Enter the secret message.
- The secret message will be xored with the special key.
- The obtained cipher text is then converted into QR code.
- Select the cover page.
- Embed the generated QR code within image.
- The final stego image is sent to the receiver.

In this proposed method QR code consists of black and white patterns where these patterns are represented by single bits 0 and 1 which in turn reduce the number bits to be embedded at large extent.

Decryption Process

The decoding process involves extraction of QR code from the stego image and reading the secret message from the QR code. XOR function is used for decryption process.

The steps involved in this decryption process are:

- Select the stego image.
- Extract the QR code from the stego image.
- Scan the QR code using Zxing online decoder.

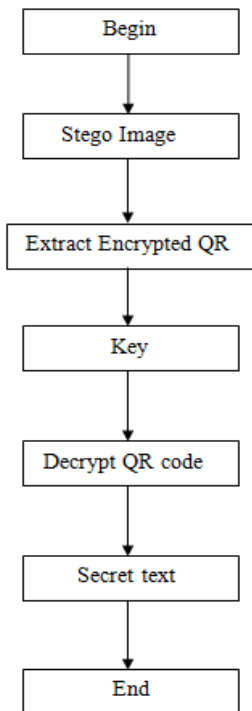


Fig. 6: Flow chart for decryption Process

### III. RESULTS AND ANALYSIS

The advantage of using both QR codes and Steganography is to enhance data security. In this algorithm the secret information is converted into QR code. The complexity of the QR code depends upon the size of the data and the pattern of the QR code varies according to the length of the data. The pattern of the QR code becomes complex if we try to store huge amount of data. A security algorithm is considered as a proficient one if the recipient can separate the correct message that was covered up and sent. In this recommended calculation the secret message is encoded utilizing a standard QR code generator (Zxing Encoder) and no transformations are applied thus the message recovered in the extraction procedure is precisely the same as the message what we have sent. It is evident from the results that the generated stego image is similar to the cover image and it cannot be identified by any one.



Fig. 7: QR code for cipher text

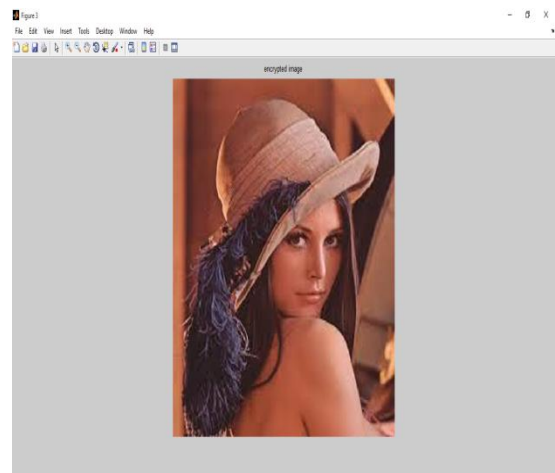


Fig. 8: Encrypted image



Fig. 9: Decrypted QR code

#### IV. CONCLUSION

This technique could be utilized as a part of vast extension. Since QR codes could be utilized for changing over data to 2D bar code (QR code), this technique can be utilized to scramble any kind of messages and send it to the receiver securely

In this paper a novel strategy is recommended for information security utilizing QR Codes and steganography. The proposed technique includes both cryptography and steganography which enhance the data security.

#### V. REFERENCES

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